

CLAIMS

1. A method of compensating a negative current flow
5 comprising:

providing a first transistor having a negative
current flow into a control electrode of the first
transistor;

coupling a driver transistor to a voltage return to
10 drive the control electrode of the first transistor;

coupling a first current carrying electrode of a
detector transistor to the control electrode of the first
transistor;

blocking the negative current from flowing from the
15 voltage return through the driver transistor; and

enabling the detector transistor to conduct a
positive compensation current from a supply voltage input
to the control electrode of the first transistor when a
voltage at the first current carrying electrode of the
20 detector transistor is no less than a first voltage.

2. The method of claim 1 wherein blocking the
negative current from flowing from the voltage return
through the driver transistor includes steering a first
25 portion of the negative current from the voltage return to
the first current carrying electrode of the detector
transistor.

3. The method of claim 2 wherein steering the first portion of the negative current from the voltage return to the first current carrying electrode of the detector transistor includes steering the first portion of the negative current to flow from the voltage return through a body diode of the driver transistor wherein the first portion of the negative current flowing through the body diode generates the first voltage across the body diode.

10 4. The method of claim 1 wherein enabling the detector transistor to conduct the positive compensation current from the supply voltage input to the control electrode of the first transistor includes enabling the detector transistor to conduct the positive compensation current that is equal to a second portion of the negative current.

5. The method of claim 4 further including conducting the positive compensation current from the supply voltage input through a reference transistor of a current mirror and generating a positive output current from the current mirror that is representative of the second portion of the negative current.

25 6. The method of claim 1 wherein enabling the detector transistor to conduct the positive compensation current includes applying an offset reference voltage to a control electrode of the detector transistor wherein the offset reference voltage is no greater than a threshold voltage of the detector transistor.

7. The method of claim 1 wherein providing the first transistor having the negative current flow into the control electrode of the first transistor includes coupling the first transistor to drive an inductor and disabling the first transistor to stop current flow

through the inductor and generate the negative current flow.

8. A negative current detection circuit comprising:
- 5 a driver transistor having a first current carrying electrode coupled to provide a positive current flow from a second current carrying electrode of the driver transistor to a voltage return;
- 10 a first transistor having a control electrode coupled to be driven by the second current carrying electrode of the driver transistor;
- 15 a detector transistor having a first current carrying electrode coupled to the second current carrying electrode of the driver transistor to provide a positive compensation current to the control electrode of the first transistor, the detector transistor having a threshold voltage; and
- 20 a current mirror coupled to conduct the positive compensation current from a voltage input to the detector transistor and coupled to generate an output current representative of the positive compensation current.

9. The negative current detection circuit of claim 8 wherein the current mirror coupled to conduct the positive compensation current from the voltage input to the detector transistor and generate the output current includes a mirror reference transistor having a first current carrying electrode and a control electrode coupled to conduct the positive compensation current to the
- 30 detector transistor, a second current carrying electrode coupled to the voltage input, and a mirror slave transistor having a control electrode coupled to the control electrode of the mirror reference transistor, a first current carrying electrode coupled to the voltage
- 35 input, and a second current carrying electrode coupled to supply the output current.

10. The negative current detection circuit of claim 9 further including a resistor having a first terminal coupled to the second current carrying electrode of the mirror slave transistor, and a second terminal coupled to
5 the voltage return.

11. The negative current detection circuit of claim 8 wherein the driver transistor having the first current carrying electrode coupled to provide the positive current
10 flow includes the first current carrying electrode coupled to an anode of a diode and a cathode of the diode coupled to the voltage return.

12. The negative current detection circuit of claim
15 11 further including a diode coupled in series with the driver transistor between the first current carrying electrode of the detector transistor and voltage return.

13. The negative current detection circuit of claim 8
20 wherein the detector transistor having the first current carrying electrode coupled to the second current carrying electrode of the driver transistor includes a control electrode of the detector transistor coupled to receive a reference voltage.

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14. The negative current detection circuit of claim 13 wherein the control electrode of the detector transistor coupled to receive the reference voltage includes the control electrode coupled to receive the
30 reference voltage that is approximately equal to the threshold voltage of the detector transistor.

15. A method of forming a negative current compensation circuit comprising:

coupling a first transistor to generate a negative current into a control electrode of the first transistor;

5 forming a driver transistor having a first current carrying electrode coupled to drive the control electrode of the first transistor, and a second current carrying electrode coupled to block the negative current from flowing from a voltage return through the driver
10 transistor to the control electrode of the first transistor; and

forming a detector transistor having a first current carrying electrode coupled to generate a positive compensation current that flows from a voltage input to
15 the control electrode of the first transistor responsively to the negative current producing a first voltage at the first current carrying electrode of the detector transistor wherein the positive compensation current is representative of at least a portion of the negative
20 current.

16. The method of claim 15 further including forming a current mirror to conduct the positive compensation current to the detector transistor and responsively form a
25 positive detection current from the current mirror that is representative of the positive compensation current.

17. The method of claim 15 wherein forming the driver transistor having the first current carrying electrode
30 coupled to drive the control electrode of the first transistor, and the second current carrying electrode coupled to block the negative current includes forming a diode in series with the driver transistor between the voltage return and the first current carrying electrode of
35 the detector transistor.

18. The method of claim 17 wherein forming the diode in series with the driver transistor between the voltage return and the first current carrying electrode of the detector transistor includes coupling the diode as one of either coupling an anode of the diode to the second current carrying electrode of the driver transistor or coupling a cathode of the diode to the first current carrying electrode of the driver transistor.

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19. The method of claim 15 wherein forming the detector transistor having the first current carrying electrode coupled to generate the positive compensation current that flows from the voltage input to the control electrode of the first transistor responsively to the negative current producing the first voltage at the first current carrying electrode of the detector transistor includes forming the detector transistor to generate the positive compensation current responsively to the negative current flow producing the first voltage that is less than a voltage applied to the voltage return.

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20. The method of claim 15 wherein coupling the first transistor to generate the negative current flow into the control electrode of the first transistor includes coupling the first transistor to drive an inductor and responsively generate the negative current flow after disabling the first transistor.

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